Nutrient profile labelling: consumers' perceptions in Germany and Belgium

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Abstract. Growing consumer interest in food and health has motivated the European food industry to provide more simple information on the nutritional composition of foods. In addition to the traditional back-of-pack nutrition table, simplified front-of-pack labels have been introduced by the food industry to allow consumers making better informed and healthier food choices. In this paper, consumers' perceptions of simplified nutrition information, namely Guideline Daily Amount (GDA) and Traffic light (TL), in Germany and Belgium are explored. Surveys in Germany (147 respondents) and Belgium (128 respondents) were conducted in 2008. Data were analysed by means of descriptive statistics and regression analysis. In both countries, the GDA is the most widely used simplified nutrition label. Whereas most consumers in Belgium indicate a preference for the GDA, in Germany the Traffic light is favoured most. Regression analyses indicate that the predilection for the different labels is affected by socio-demographic characteristics and perceptions towards the respective labels. European nutrition policy makers should be aware of regional differences regarding the perception of simplified nutrition labels. The challenge for international food industries is therefore to raise awareness of the potential function of simplified labels in making informed and healthy food choices among different European consumer groups.

Keywords: Nutrient profile labelling; Nutrition policy; European food industry; Consumer survey.

1. Introduction

Consumption of a variety of foods during a day or a week helps to realise a balanced diet. However, as the increasing diet-related health problems suggest, a growing part of consumers seems to struggle with making informed and healthy food choices. As a result, obesity in Northern America and Europe is constantly rising[1, 2], which is to a great extent due to an increased consumption of energy-dense food and lower physical activity levels.

Food choices can be improved by nutritional labelling of products[3]. For example, German consumers consider back-of-pack (BOP) information on packaged foods as their main source of nutrition information[2]. In addition to these traditional back-of-pack nutrition tables, simplified front-of-pack labels have been introduced recently by the food industry. As nutrient profile labelling is voluntary in the EU, diverse labels were used in different countries by the food industry, the service and catering companies, and the retailing sector. These different labels display the information of interest based on different reference settings (e.g. a portion or per 100g/ 100ml) and in different designs. Golan et al. (2001) point out that information on the label has to be clear, concise and informative to enable consumers to make better informed purchase decisions, whereas unclear information may increase search and information costs[4]. Therefore, our study seeks to explore how European consumers perceive different kind of labels. We focus on the Guideline Daily Amount (GDA) and Traffic light (TL) label. Special attention is drawn to consumer's attitudes towards these simplified nutrition information schemes. The results will give further insights in the informative value of simplified nutritional labelling.

The paper is organised as follows: Section 2 provides the theoretical framework and addresses economic issues of food labelling. In Section 3, detailed information on different simplified front-of-pack labels is given as well as a description of nutritional labelling in the respective countries, Germany and Belgium. In the next section, background information on both parts of the quantitative study is given. In section 5, results are shown. The last section summarises the results from both countries and concludes with implications for nutrition policy makers as well as for the European food industry.

2. Theoretical framework and economic issues

This section traces the economic theory behind simplified front-of-pack nutritional labels. Three parties of interest are considered: the consumers, the firms, and the government. In doing so, effects for voluntary as well as mandatory labelling are discussed.

Consumers

Stigler (1961) suggests that consumers will continue to seek and process information as long as the additional costs do not outweigh the additional benefit[5]. In this context, simplified nutrition labelling schemes may reduce the costs of information acquired by consumers and enable them to make informed and healthy food choices[1]. Hartmann et al. (2009: 131) point out that in the case of nutrition or health claims direct economic benefits emerge because truthful and correctly understood claims increase the efficiency of purchase decisions[7]. The same holds true for simplified front-of-pack nutritional labels as these labels may enable consumers to improve their diet by eating less of the foods with a label indicating that their composition is not healthy (e.g., a product with high fat content). Bear in mind that labels are signals of quality of the products and that products without such a label may alert consumers about its absence[4]. As a result, despite the situation that simplified nutrient labelling is voluntary, firms may choose to label as many products as possible and/or to introduce a new label in order to give the consumers the impression of quality. Additionally, substantial beneficial spillovers can be expected from claims for the information market[7]. The same holds true for simplified front-of-pack (FOB) nutritional labels: the most obvious effect is the reduction of consumers' cost for information search with regard to nutrition. As a result, simplified front-of-pack labels can enhance knowledge about the linkages between food and health, thereby increasing the demand for and supply of innovative products with healthier nutrient composition. Empirical evidence reveals that consumers pay attention to nutrition labels. Moreover, they report to feel confident that using the food labels is better than relying on their own knowledge[8]. Drichoutis et al. (2006b) developed a conceptual framework of factors affecting the use of on-pack nutrition information. Among these factors are (a) individual characteristics (e.g., gender or age); (b) situational, attitudinal, and behavioural determinants (e.g., income, household size and composition, diet-health awareness); (c) product class involvement (e.g., price or taste); (d) knowledge; (e) motivation factors; and (f) other factors (e.g., scepticism towards claims, attitudes). As a result, the use of food labels may lead to specific purchasing behaviour and consequences for a diet[9]. Teisl et al. (2001) point out that due to improved nutrition information individuals can increase their utility. E.g., in the case of hypertension, a product with labelled low salt content can lead to an overall reduction in salt intake (if the consumer chooses to eat less of this product) or can lead to a broader variety of products eaten by the consumer (if consumer allows himself after consumption of a low salt product other products he enjoys)[10]. Jessup (2001) concludes therefore, the nutritional labels do not limit necessarily food choices[11].

But, negative spillover effects seem also plausible if consumers substitute information from objective experts like consumer protection organisations or nutrition education by nutritional labels which are perhaps so designed that they favour a labelled product[12]. For example, a food label with information based on portion sizes which are small compared to what is consumed on one eating or drinking occasion, may lead to overconsumption of the respective product[2]. Additionally, it may happen that consumers feel that a label dictates what they have to buy (especially, if these consumers normally favour a healthy diet and eat less healthy products are only occasionally).

However, direct economic costs occur if the health benefit of a product with a simplified front-of-pack label can not be identified by consumers. Akerlof (1970) refers to this problem as the 'lemon problem', originally exemplified for the market of second-hand cars. The author states that only low quality products (e.g., food with no or unfavourable nutrient composition highlighted by nutritional labelling) are

[1] Drichoutis et al. (2006a) develop a theoretical model of nutritional label use with reference to Stigler's theory. The authors incorporate the time consumers spend on reading food labels as part of individual's choice process and purchase behaviour. Additionally, the authors test their model empirically and identify profiles of consumers more likely to read food labels[5].

[2] Cases in point are portion sizes in the so-called Guideline Daily Amount labelling (detailed explanation is given in section 3). E.g., information on food composition of potato chips is displayed with a portion size of 25g (example is drawn from German leading brand), inducing that the fat content is not as high as suggested by consumer protection organisations and other experts.

sold even though consumers are willing to pay higher prices for high quality products (products with favourable nutrient composition) [13]. As a result, this can lead to market failure. Drichoutis et al. (2006b) claim that mandatory labelling of food composition can correct such asymmetric information[9]. Golan et al. (2001) point out that another type of information problem may be relevant, that is imperfect information. In this case long-term health effects of a food or food attributes are unknown, meaning that relevant market information does not exist[4].

In the case of mandatory food labelling consumers can rely on standardised nutrition information, with the above mentioned benefits and problems. Jessup (2001) concludes that more complete and comparable information, provided by mandatory labelling, may expand food choices of consumers[11].

Firms

As long as additional information generates more revenues than costs, firms are motivated to add voluntary simplified nutritional labels on their products. As an example, the German Frosta AG decided to introduce traffic light labelling on four of their most-sold frozen convenience products in August 2009[14]. This announcement was published in several German newspapers, indicating a "first mover advantage" if the company offer products in line with "favourable" information displayed (e.g., no or a reduced number of red bars if a coloured label will be introduced). However, some limitations with regard to possible market incentives exist[4]. First, firms may have difficulties to choose the information desired by consumers as preferences of consumers vary. E.g., consumers may favour information displayed per portion or per 100g/ 100ml. Second, some product categories may have an undesirable nutrient that can not be changed (e.g. fat content of oils). Third, label information may have a "public good" character, implying that additional information provided by one firm may be advantageous for all other firms in the market, too.

Mandatory simplified nutritional labelling can increase market performance, as products with unfavourable nutrition profile labelling will either leave the market or may be tailored to the requirements of healthy nutrition (e.g., reformulation by changes in recipes to reduce the content of critical nutrients like fat or sugar) [15]. Additionally, mandatory food labelling can induce food innovations[9, 16]. It has to borne in mind that mandatory simplified food labels may results in higher costs due to new designs of packages, new information provided in printed and internet media as well as costs induced by product changes.

Government

It is noteworthy that even in the case of voluntary simplified nutritional labelling the government is involved. Two regulations make up the framework for nutrient profile labelling in the European Union (EU). First, the Council Directive of September 24th 1990 on nutrition labelling for foodstuffs (90/496/EEC) aims to enable consumers to make healthier food choices using simple nutrition information which is easily understood. Such simplified nutrition labels should be related to key nutritional elements (energy value, protein, carbohydrates, fat, fibre, sodium, selected vitamins and minerals) of the food product. In doing so, the regulation deals with the general nutritional labelling provisions. The directive points out that all other forms of nutritional labelling should be prohibited but foodstuffs bearing no nutritional labelling should be able to circulate freely[17]. As a result, up to now nutrition labelling on packaged foods in the EU is voluntary. In addition, due to different initiatives of stakeholders in the food industry a divergence in the labelling schemes occurred, which can create barriers to trade. As a result, the harmonisation of nutrient profile labelling is actively discussed[18]. Second, the Regulation (EC) No 1924/2006 of the European Parliament and of the Council of December 20th 2006 on nutrition and health claims made on foods[3], aims to prevent consumer deception. The intent of the regulation is to ensure that foods are safe and adequately labelled, as a rising number of products bear nutrition and health claims and are advertised with this information. As there is a wide variety of claims currently used in the labelling and advertising of foods in some Member States, the directive points out that it is necessary that the substances for which a claim is made have been shown to have a beneficial nutritional or physiological effect[19].

[3] Nutrition claims emphasize special food ingredients, whereas health claims deal with the impact of food on health. It has to bear in mind that despite nutrition claims do not predict a positive impact on health consumers perceive them like implicit health claims[7].

Governmental decisions to introduce mandatory simplified nutritional labelling lead to increases in informed consumption and socially desirable changes in consumption behaviour (Golan et al. 2001). The authors point out that mandatory labelling can be useful in the case of externalities. If individual food choices of consumers affect the welfare of other consumers (e.g., through higher costs in the health care system), governments may introduce nutrient profile labelling to help consumers to make healthier food choices. Additionally, Petruccelli (1996) indicates that mandatory labelling reduces the confusion among firms and consumers, leading to better market performance[16]. Mandatory labelling, as explained above, gives firms incentives to reformulate and/or improve their products. In doing so, all consumers who buy these products and not only the consumers who read the label, benefit. However, mandatory labelling induces costs, too. These include costs of program initiation, administration and enforcement [4].

Figure 1 summarises these possible outcomes and drawbacks of simplified nutritional labelling.

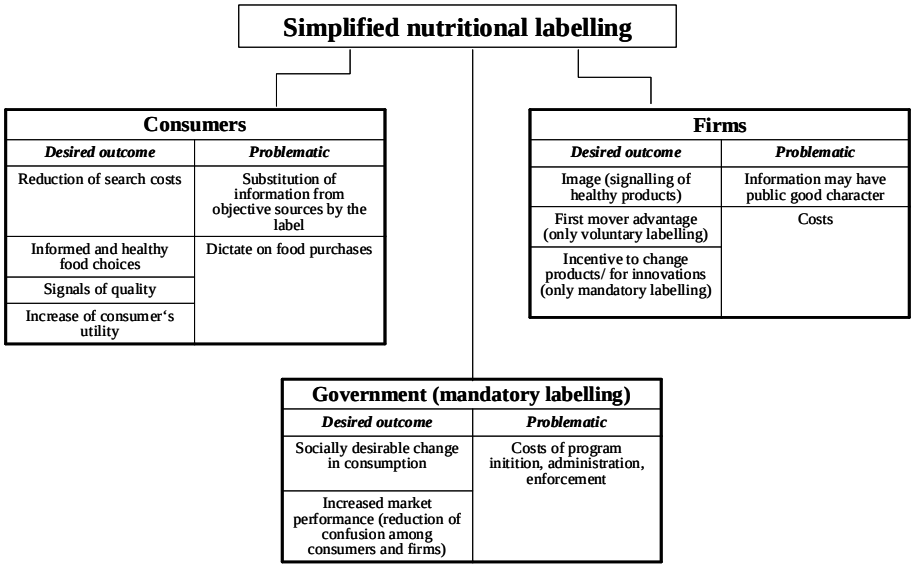


Figure 1. Outcomes and drawbacks of simplified nutritional labelling

The discussion above highlights several economic aspects of nutrient profile labelling. Summing up, labelling may be an effective and appropriate policy tool if[4]:

- Information is clear, concise and informative, leading to reductions in search and information costs of consumers.
- Consumer preferences differ. Additional information helps consumers to match their preferences with their purchase decisions, whereas bans or taxes affect only the consumers who (want to) buy these products.
- Costs and benefits of consumption are borne by the consumers. Information-based policies are insufficient if the consumption of a product leads to externalities.
- No political consensus on regulation exists. Information-based policies may be regarded as the path of least resistance in contrast to bans or taxes, but bear in mind that in this case the informational value of a label may be reduced.

As the informative value is the most important feature of nutrient profile labelling, in the following section different simplified nutritional labelling schemes are discussed with regard to information display. The case studies in Germany and Belgium highlight consumers' perceptions of the informative value of different labelling schemes.

3. Nutrient profile labelling in Germany and Belgium

As nutrient profile labelling is voluntary in the EU, diverse labels were used in different countries by the food industry, the service and catering companies, and the retailing sector. Therefore, we discuss the label implementation in the countries of interest, i.e., Germany and Belgium. In doing so, we want to emphasise connections to the theoretical considerations in Section 2.

Guideline Daily Amounts (GDAs)

The Confederation of the Food and Drink Industries of the EU (CIAA) promoted a voluntary nutrition labelling system based on the **Guideline Daily Amounts** (GDAs). Introduced in June 2006, this label is implemented throughout Europe. According to CIAA, nearly half of European food and drink producers either currently use or planned to introduce the voluntary GDA in 2008[20]. The aim of GDAs is to provide "typical energy and macronutrient intake levels that most people are advised to consume daily for a healthy diet. People vary in many ways, such as age, size and level of physical activity. Therefore, GDAs are not targets for individuals, but provide consumers with a benchmark against which the contribution from macronutrients provided by a food product can be assessed" (CIAA 2006: 5). The nutrition information is delivered per serving (Figure 2). CIAA recommends that food and drink industries determine the serving or portion size for a food or drink themselves and points out that "serving size should reflect the amount of the product that can reasonably be expected to be consumed on an eating or drinking occasion" (CIAA 2006: 5). In Germany, several branded and generic products have been labelled with the GDA scheme up to now. The same holds true for Belgium, where the GDA is the simplified nutrition label most widely used by the food industry.

In Belgium, the retail leader Carrefour has introduced an alternative to the classic GDA. An example of this modified GDA is illustrated in Figure 2

German consumer protection organisations as well as scientific nutrition organisations criticise the GDA labelling strongly. First, the scientific foundation for reference levels (especially the reference level for energy intake) seems to be random. Second, as the GDAs are based on the nutrition requirements for an average adult of healthy weight and average activity level, the misinterpretation by several consumer groups (e.g., children or elderly people) is likely. Third, as the food and drink companies shall determine the size of a serving in such a way that a portion reflects the amount of the product that is consumed in one eating or drinking occasion, especially energy-dense food products (e.g., snacks) are displayed with a comparatively small portion. Additionally, different portions sizes, recommended on diverse products may lead to consumer confusion[22].

Traffic light labelling (TL)

Food products with **traffic light (TL)** labels show consumers through coloured bars whether the food has high, medium or low amounts of fat, saturated fat, sugars and salt (see Figure 2). A red bar marks a food that is high in the respective nutrient. Green colour means that the food is low in that particular nutrient. An increasing number of green bars indicate a healthier choice. In addition to traffic light colours, sometimes the information on amount of fat, saturated fat, sugars and salt is displayed, mostly per 100 g or 100 ml of the food[23]. German nutrition policy makers vote against the introduction of the traffic light labelling, despite the fact that a representative survey clearly indicates that German consumers favour this kind of labels[24]. The German Frosta AG decided to introduce traffic-light labelling on four of their best-selling frozen convenience products in August 2009[14]. However, it has to be borne in mind that despite the easier comprehensibility of the coloured labelling consumers have to evaluate the information displayed carefully.

Healthy logo

Two types of simplified nutrition labels are used in Belgium, namely the GDA scheme and healthy logos. A healthy logo is a simple front-of-pack (FOP) symbol that summarizes the whole nutritional profile and gives an identification of healthy variants, meeting pre-set criteria based on international dietary recommendations.

As such a healthy logo can only be found on a selection of the food supply. Following from a small store check in Belgium's largest supermarket chains, Unilever's My Choices logo is the most commonly used healthy logo. This symbol is additional to existing nutrition information, such as the GDA. An illustration of the logo can be found in Figure 2.

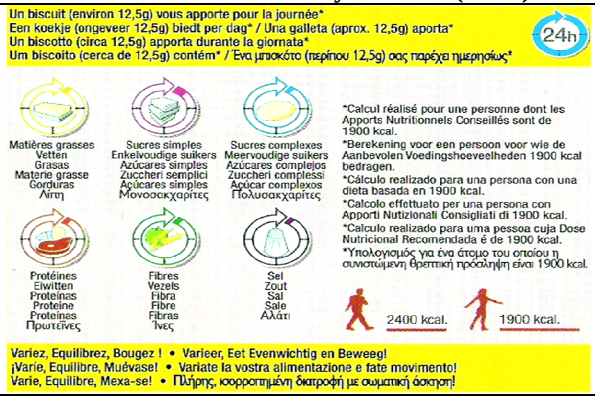
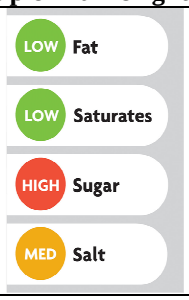
Guideline Daily Amount (GDA)	Modified Guideline Daily Amount (GDA)
	
Multiple Traffic light (TL)	**Healthy logo**
	

Figure 2. Nutrient profile labelling systems

4. Description of the studies

Given this background, we assess the preferences of consumers for the most relevant nutrient profile labelling in the respective countries and identify the main specific determinants affecting these preferences. We conducted two studies in Germany and Belgium, which account for the country-specific implementation and ongoing discussion of simplified front-of-pack labels.

4.1. Germany

To investigate preferences of German consumers towards different labelling systems, a standardized questionnaire was developed. It included questions related to GDA labelling, which is already introduced and widespread used by the food and drink industries, as well as questions about the multiple traffic-light labelling, favoured by German consumer protection organisations. The face-to-face interviews were carried out in December 2008. In total 147 adult consumers were recruited at public places in the region of Giessen/Frankfurt in Germany. The sample includes 76 women (52%) and 71 men (48%) between 18 and 81 years (Table 1). The comparison of the distribution of selected socio-demographic variables within the sample and of whole the German population reveals that older consumers as well as consumers not qualified for university admission are underrepresented in the sample. This limits a generalisation of the findings beyond the sample characteristics.

Table 1. German sample characteristics

Sample characteristic	Characteristic level	Percentage (%, n = 147)
Gender	Male	48.3
	Female	51.7
Age (years)	<25	23.1
	26-40	28.6
	41-50	19.1
	51-65	19.7
	>65	9.5
Education	University degree	53.7
	Lower educational level	46.1
Children in the household	Yes	45.9
	No	54.1
Health status	Very well	13.6
	Well	68.7
	Moderate	25.2
	Bad	4.8
	No answer	1.4

Main areas of interest in the survey were (1) relevant information sources in the field of nutrition, (2) comprehensibility of nutrition information displayed by the different kind of labels (GDA vs. TL), (3) consumers' perceptions regarding the different labels (GDA vs. TL) and (4) consumers' preferences towards the information display (per portion or per 100 g/ 100 ml) and the kind of label (GDA or TL).

Data management and analysis were performed using SPSS 17.0 (SPSS Inc., Chicago, IL, USA). Significance was assessed at $\alpha = 0.10$. The use of different nutrition information sources and the preferences of German consumers regarding nutrient profile labelling are provided by means of frequency distributions. The logistic regression model was used to determine the predictors of the preference for the GDA and TL label as well as with regard to the information display. The model included socio-demographic characteristics as well as results from factor analysis with regard to the perception of German consumers regarding GDA and TL labeling. The Nagelkerke R Square and the Hosmer and Lemeshow Goodness-of-Fit were applied to assess whether the models' estimates fitted the data at an acceptable level.

4.2. Belgium

Survey data were collected through a quantitative questionnaire in Flanders, Belgium, during April 2008. Subjects were personally addressed and asked to complete a self-administered anonymous questionnaire. The total sample consisted of 128 consumers, including 68 women (53%) and 60 men (47%) in the age range 17-80. A non-probability convenience sampling procedure was applied with a view to obtain a representative distribution of socio-demographic characteristics. As shown in Table 2, the sample covers a wide range of consumers in terms of socio-demographics. An over-sampling of the age categories <25 and 41-50, and the overrepresentation of higher educated respondents is probably due to the convenient character of the sampling. This limits a generalisation of the findings beyond the sample characteristics.

The questionnaire's purpose was to explore (1) consumers' importance and use of information cues on pre-packed foods, (2) attitudes towards simplified nutrition information in general (interest in nutrition information, perceived label importance, label attention, label trust, label understanding, label use and label effect on purchase intention) and (3) perception of specific nutrient profile labels (e.g. GDA and TL) (see Figure 9).

Data management and data analysis were performed using SPSS 15.0 (SPSS Inc., Chicago, IL, USA). Significance was assessed at $\alpha = 0.05$. Descriptive statistics of the importance and use of different information cues, and of the preference of Belgian consumers regarding nutrient profile labelling are provided by means of frequency distributions. Three separate logistic regression models were estimated with the same dichotomous dependent variable 'preference GDA versus TL'. The first model was based on person-related variables: socio-demographics (gender, age, presence of children in household, educational level), body mass index (BMI), being on diet or not, personal food-related illness, food related illness in close environment, food-health involvement. All independent variables were introduced as categorical, with the exception of 'age', 'BMI', 'food-health involvement', which are continuous. The second model considered general labelling attitudes ('interest in nutrition information', 'subjective nutrition knowledge', 'label importance', 'label trust', 'label understanding') as potential drivers of consumer's label preference. Each of the independent variables was introduced in the model as a covariate. Final model was checked for the predictive value of consumer perceptions of the respective labels. The independent variables, namely 'familiarity with label (GDA or TL)', 'label usefulness', 'label comprehensibility', 'label attractiveness', were included as covariates.

All covariates except 'age' and 'BMI' were measured on a 5-point interval scale. To determine which variable was to be retained in the final three models, a backward Wald procedure was used. The removal of variables was at $\alpha > 0.05$ for the Wald test. Any outlier or observation of more than two standard deviations from the mean was excluded from the logit analysis. The Nagelkerke R Square and the Hosmer and Lemeshow Goodness-of-Fit were applied to assess whether the models' estimates fitted the data at an acceptable level.

Table 2. Belgian sample characteristics

Sample characteristic	**Characteristic level**	**Percentage (%, n = 128)**
Gender	Male	46.9
	Female	53.1
Age (years)	< 25	31.3
	26-40	8.6
	41-50	30.5
	51-65	18.8
	> 65	10.9
Education	University (college) degree	65.6
	Lower educational level	34.4
	Yes	47.7
Children in the household	No	52.3
	Underweight (BMI < 18,5 kg/m²)	4.7
BMI (kg/m²)	Normal weight (BMI = 18,5 - 24,9 kg/m²)	64.1
	Overweight (BMI ≥ 25 kg/m²)	23.4
	Obese (BMI ≥ 30 kg/m²)	7.8

5. Results

5.1. German study

In order to appraise the relevance of different healthy eating information sources, the respondents were asked to evaluate some of them. As shown in Figure 3, the packaging of prepared food products appeared to be the most important information source for interviewees, followed by information printed in newspapers. In line with Stigler's information economics theory (1961), this result indicates that German consumers seek and favour easily available sources of information, i.e., packages of prepared foods.

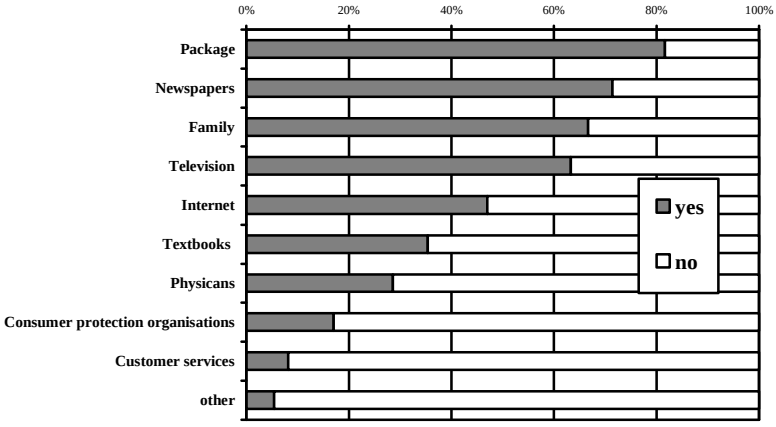


Figure 3. Respondent's usage of nutrition information sources

Nearly three fourth of the respondents prefer objective nutrition information per 100g or 100ml in contrast to the information based on portion sizes (Figure 4). Additionally, a coloured nutrient label "traffic light" preferred to GDA label.

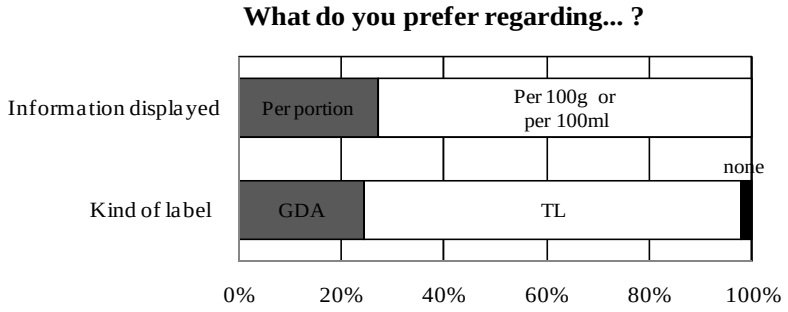


Figure 4. Preferences of German consumers regarding nutrient profile labelling

Interviewees were asked to express their perceptions of GDA and traffic light labelling by means of a five-point Likert scale indicating agreement or disagreement with a number of statements. Figure 5 shows that German consumers perceive these labels quite differently. Thus, the TL is considered to be easier to interpret and designed more appealingly. It also helps consumers to make their food choices more easily, and seems to be more trustworthy. Additionally, in line with costs involved in information search, German consumers agree that reading the traffic-light labelling is less time consuming compared to the GDA label.

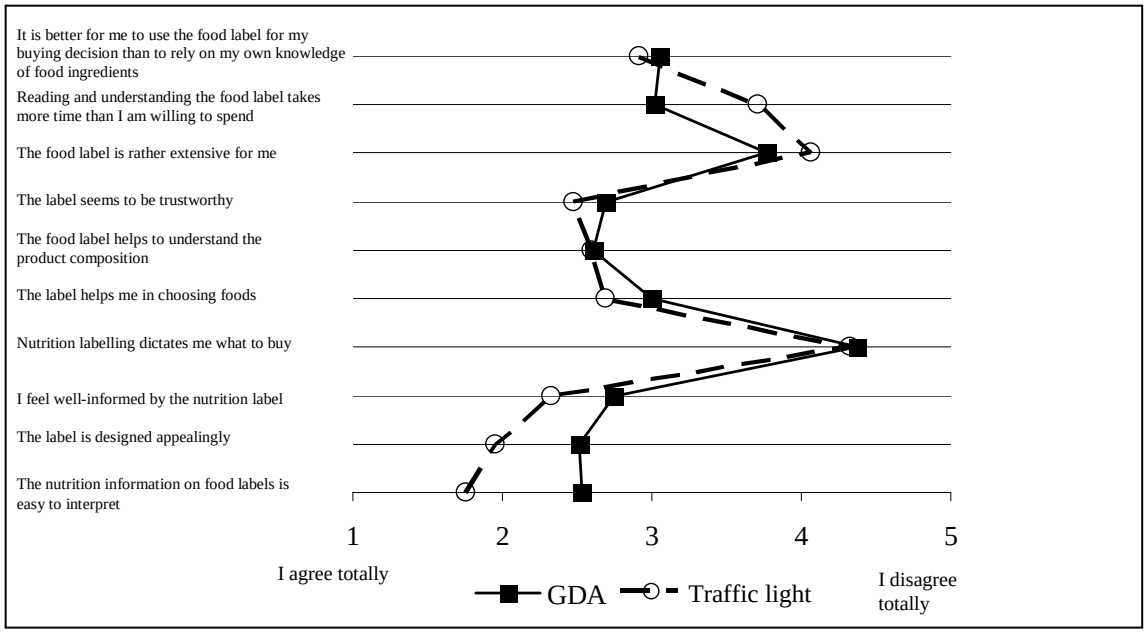


Figure 5: Perceptions of German consumers regarding the nutrient profile labels

To get deeper insight into main criteria driving consumers' preferences for nutrient profile labelling, consumers' perceptions of labels were condensed via factor analysis. With regard to the Kaiser-Meyer-Olkin-criteria, the overall goodness of data fit was acceptable (KMO-criteria of 0.737). As a result, three factors emerged. The factor *comprehensibility/design* is associated with the statements "The nutrition information on food labels is easy to interpret", "The label is designed appealingly", "I feel well-informed by the nutrition label" and "The label seems to be trustworthy". The factor *help for shopping* is related to "The label helps me in choosing foods", "The label seems to be trustworthy", "The food label helps to understand the product composition", and "Nutrition labelling dictates me what to buy" statements. The last factor, *complexity*, is connected with "The food label is rather extensive for me", "It is better for me to use the food label for my buying decision rather than to rely on my own knowledge of food ingredients" and "Reading and understanding the food label takes more time than I am willing to spend" statements.

A logit analysis was used to determine the influence of socio-demographic characteristics and consumer perceptions on preferences for information display (per 100g/100m vs. per portion) and label design (traffic light labelling vs. GDA). Table 3 summarises the obtained results.

Table 3: Odds ratios of the preference with regard to simplified nutritional labels in a sample of German consumers

	Preferences for information displayed per portion vs. per 100g or ml (Per 100g or ml = 1; per portion = 0, reference)		**Preferences for GDA vs. traffic light** (GDA = 1; TL = 0, reference)	
	OR (95.0% CI)	*P* -value	OR (95.0% CI)	*P* -value
Gender (woman = 1; man = 0, reference)	1.52 (0.86-2.70)	0,151	0.40 (0.21-0.74)	0,004
Children in household (Yes = 1; No = 0, reference)	5.00 (2.50-10.00)	<0.001	0.51 (0.26-1.01)	0,055
Educational level (University degree = 1; lower degree = 0)	3.33 (1.71-6.48)	<0.001	1.02 (0.52-2.03)	0,95
Comprehensibility/design[1]	1.15 (0.86-1.53)	0,351	0.73 (0.53-1.02)	0,062
Help for shopping[1]	1.16 (0.87-1.56)	0,306	1.18 (0.85-1.62)	0,32
Complexity[1]	1.50 1.12-2.01)	0,006	0.86 (0.63-1.18)	0,35
H&L	0,094		0,896	

[1] Factor scores estimated with factor analysis.

Consumers with higher educational level prefer information displayed per 100g or 100ml nearly three times more than consumers with lower education (P = 0.000). Additionally, nutrient profile labelling per objective measures (in 100g or 100ml) is favoured by individuals with children in household (P = 0.000)

and by persons who regard the simplified front-of-pack labels as too complex (P = 0.006). The model accounted for approximately 12.5% (Cox & Snell R Square) to 18.2% (Nagelkerke R Square) of the variance and each model presented with a non-significant Hosmer and Lemeshow Goodness-of-fit test (P-value > 0.05), which indicated a good overall fit.

On the other hand, the GDA is not favoured by women: female persons have a lower probability to prefer the GDA label than men (P = 0.004). This kind of labelling is also not preferred by individuals with children in household (P = 0.055). Additionally, consumers do not prefer the GDA label if they perceive simplified front-of-pack label as comprehensible and appealingly designed (P = 0.062). The model accounted for approximately 7.1% (Cox & Snell R Square) to 10.5% (Nagelkerke R Square) of the variance. The Hosmer and Lemeshow Goodness-of-fit test is not significant (P-value > 0.05), which indicated a good overall fit.

5.2. Belgian study

In the Belgian study, the respondents were asked to report how often they use and how important they consider seven information cues that usually appear on the food label or package. The results are summarised in Figure 6 (use) and Figure 7 (importance). Use of the cues was measured on a 5-point Likert scale ranging from "never" to "always", while the measurement scale for importance ranged from "not at all important" to "very important". Expiry date and price are the most frequently used information cues while going food shopping, followed by the brand name and quality labels. FOP and BOP nutrition information are less used. The analysis of the importance respondents attach to the information cues shows that the expiry date and price are considered as the most important cues of information. Other cues like quality label, brand name and nutrition information (front-of-pack or back-of-pack) are perceived as almost equally important.

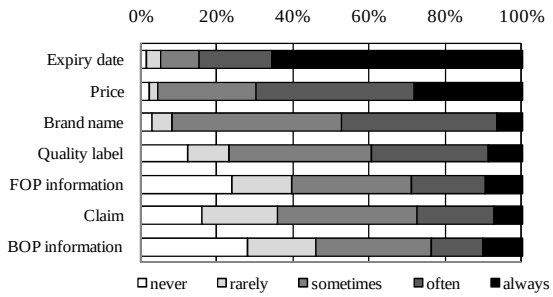


Figure 6. Use of information cues, frequency distribution (%, n = 128)

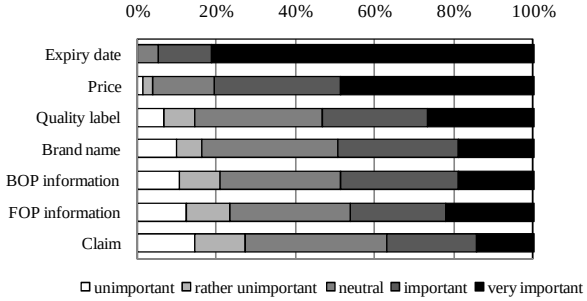


Figure 7. Importance attached to information cues, frequency distribution (%, n = 128)

Figure 8 shows that individual differences exist with respect to the preferred nutrition labelling format. As indicated in the first frequency bar, the GDA and claims are preferred above the TL, healthy logo and modified GDA. The most preferred labelling format is definitely the GDA label. The GDA is the most widely used simplified nutrition label by the food industry in Belgium.

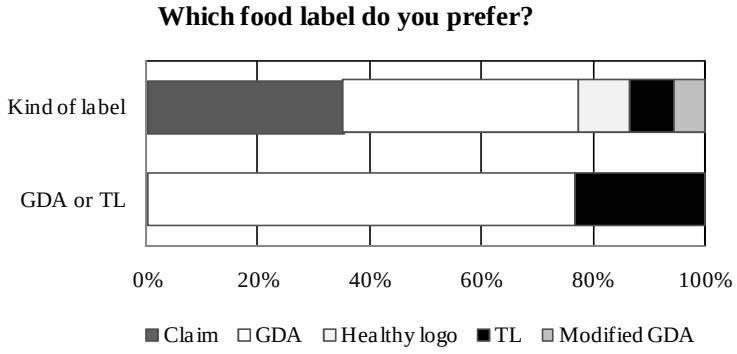


Figure 8. Preference of Belgian consumers regarding nutrient profile labelling

Consumer perception of the GDA and TL label as being useful, understandable, clear, attractive and necessary was measured on a five-point Likert scale ranging from agreeing 'not at all' over 'neutral' to 'very much'. Respondents were also asked about their familiarity with the label on a similar scale. The results are summarised in Figure 9. The mean perception scores on all statements are around three, but a general higher score is obtained for the GDA compared to the TL label. This indicates that the Belgian consumer has a rather neutral perception of food labels (same results obtained for other labels mentioned in figure 8) with a small preference for the GDA above the TL on tested attributes.

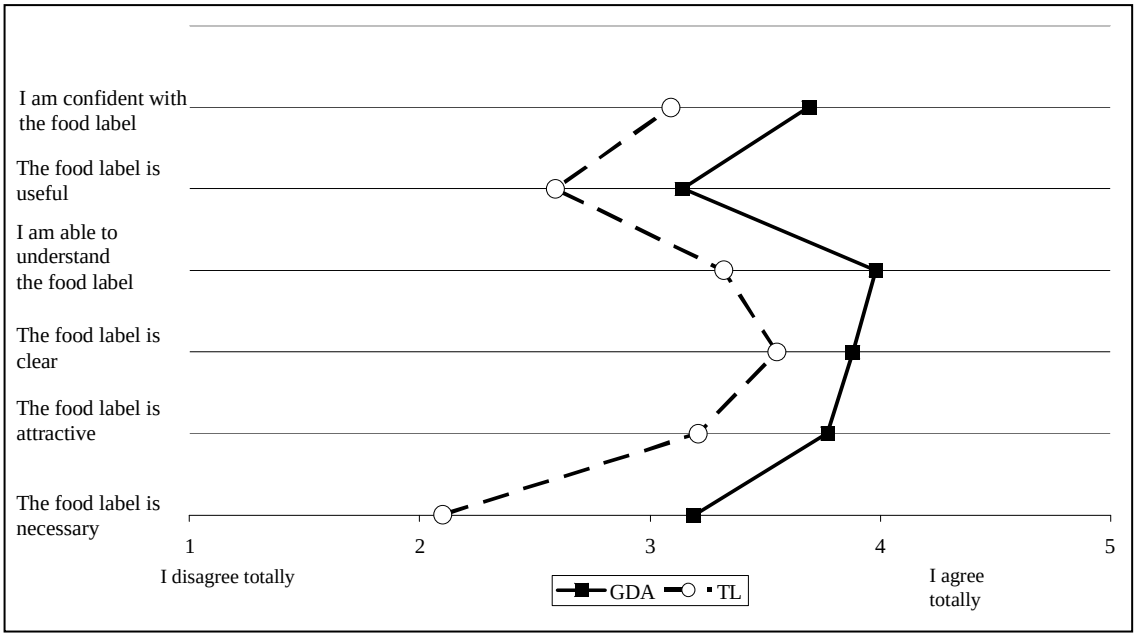


Figure 9: Perceptions of Belgian consumers regarding the nutrient profile labels

In order to gain additional insights into main drivers of consumers' preference between GDA and TL, several logistic regression models were tested. Table 4 shows the odds ratio of the relative preference between the GDA label and TL in a sample of Belgian consumers according to person related characteristics (Model I), general labelling attitudes (Model II) and respective label perceptions (Model III) that were retained by the backward Wald logistic regression.

Women have a 19 times higher probability to prefer the GDA label than men (P = 0.006). Other but negative associated person related predictors of the preference of GDA above TL are age (P = 0.004) and body mass index or BMI (P = 0.009). The only retained although non-significant predictor with regard to general labelling attitudes is interest in nutrition information (P = 0.068). According to Model III, the GDA label is also preferred by individuals who are familiar with the label and who perceive the label as attractive (P = 0.029) and comprehensible (P = 0.093). An inverse association was detected between the preference for GDA versus TL and the perceived usefulness of TL labelling.

The final model I, II, III accounted, respectively, for approximately 30.4%, 21.8%, 21.6% (Cox & Snell R Square) to 56.0%, 77.0%, 32.8% (Nagelkerke R Square) of the variance and each model presented with a non-significant Hosmer and Lemeshow Goodness-of-fit test (P-value > 0.05), which indicated a good overall fit.

Table 4. Odds ratio of the preference of GDA above TL labelling in a sample of Belgian consumers

	Preference for GDA vs. TL label (GDA = 1; TL = 0, reference)					
	Model I		Model II		Model III	
	OR (95.0% CI)	*P* -value	OR (95.0% CI)	*P* -value	OR (95.0% CI)	*P* -value
Person related characteristics (H&L = 0.234)						
Gender (woman = 1; man = 0, reference)	19.18 (2.36-156.06)	0.006				
Age	0.92 (0.86-0.97)	0.004				
BMI	0.71 (0.55-0.92)	0.009				
General labelling attitudes (H&L = 1.000)						
Interest in nutrition information			1.44 E+4 (0.49-4.3 E+8)	0.068		
Respective label perceptions (H&L = 0.086)						
GDA familiarity					1.56 (1.08-2.26)	0.019
GDA comprehensibility					1.53 (0.93-2.51)	0.093
GDA attractiveness					1.87 (1.07-3.28)	0.029
TL usefulness					0.39 (0.22-0.69)	0.001

6. Conclusion

In addition to the traditional back-of-pack nutrition table, simplified front-of-pack labels have been introduced by the food industry to depict the nutritional value of a product more evident. Two regulations set the framework for nutrient profile labelling in the EU that is, however, still voluntary. This paper addresses the simplified front-of-pack labels from a theoretical as well as empirical point of view.

From a theoretical perspective, food labelling can be considered from different perspectives. Summing up, consumers gain a reduction in search costs if the label is clear, concise and informative. Producers, who sell their products already in line with recommendations for healthy eating, may profit from a first mover advantage. The German Frosta AG, which wants to introduce soon the TL on some of their products, is a case in point. The gains for producers, who have to modify their products to achieve a favourable product, are smaller as they face additional costs due to product change. Mandatory simplified nutritional labelling enforced by the government lead to increases in informed consumption and socially desirable changes in consumption behaviour. However, the costs for implementation of the labels and enforcement have to be considered.

Empirical case studies in two European countries, Germany and Belgium, reveal several interesting findings with regard to nutrient profile labelling. First, European consumers face an ever-increasing set of nutrition profile labelling schemes, which are introduced by different agents in the food industry. Despite the clear intention to simplify nutrition information for consumers, the already existing labelling schemes use different reference settings (information per portion sizes vs. per 100g or 100ml) and designs (monochromatic vs. coloured labels). However, due to the efforts of the Confederation of the Food and Drink Industries in the EU (CIAA), the GDA label is the simplified nutrition label most widely used by the food industry in Germany and Belgium. With regard to information economics, the different labelling systems may lead to consumer confusion and increased costs of information search.

Second, the empirical studies in both countries reveal that consumers seek and favour easily available sources of nutrition information, like information on packaging. German consumers prefer information displayed per 100g or 100ml of product and the coloured TL labelling. In contrast, Belgian consumers appreciate the GDA label. These differences in perception possibly can be traced back to the fact of the ongoing public discussion of the introduction of the TL label in Germany, whereas in Belgium the GDA label has been widely introduced and generally accepted.

Third, logit analyses in both countries of interest reveal that the preferences for one kind of label are not uniformly dependent on specific socio-demographic characteristics. Whereas Belgian women favour the GDA label, German women prefer the TL label. Unlike in Belgium, the presence of children influences the label preference in Germany. The preference of Belgian consumer is affected by age and BMI. In addition, in both countries consumer's perceptions of nutrient profile labelling influences stated preferences with regard to simplified food labels. The German preference for the TL label is driven by its comprehensibility and appealingly design, while Belgians' preference for the GDA label is associated

with its familiarity and attractiveness. However retained in the final model, the comprehensibility of the label is not a meaningful determinant of the preference for the GDA in Belgium.

Golan et al. (2001) point out that nutritional labelling schemes are best suited to improve problems of asymmetric information in a market if the information presented is clear, concise and informative. To achieve this goal, European nutrition policy makers should set up a mandatory regulation framework for simplified front-of-pack labels as soon as possible to reduce further confusion and to enable consumers to make better informed and healthier food choices. In addition, the European food industry should be aware of regional differences regarding the perception of simplified nutrition labels. Whereas in Germany the TL label seems to be easier to understood, in Belgium consumer favours the GDA label. The challenge for international food industries is therefore to raise awareness among different European consumer groups about potential help of simplified labels in making informed and healthy food choices. However, it has to bear in mind that small improvement in health due to appropriate nutritional labelling schemes may be counterbalanced by lack of exercise and increased food consumption (Jessup 2001).

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